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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,703	07/28/2003	Stefan Graf	71079	4060

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EXAMINER

MARC, MCDIEUNEL

ART UNIT	PAPER NUMBER
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3661

DATE MAILED: 05/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Interview Summary	Application No.	Applicant(s)	
	10/628,703	GRAF ET AL.	
	Examiner	Art Unit	
	McDieunel Marc	3661	

All participants (applicant, applicant's representative, PTO personnel):

- (1) McDieunel Marc. (3) ____.
- (2) Daren Kang, Reg., No. 51,859. (4) ____.

Date of Interview: 12 May 2006.

Type: a) ☒ Telephonic b) ☐ Video Conference
c) ☐ Personal [copy given to: 1) ☐ applicant 2) ☒ applicant's representative]

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☐ No.
If Yes, brief description: ____.

Claim(s) discussed: None.


Identification of prior art discussed: None.

Agreement with respect to the claims f) ☒ was reached. g) ☐ was not reached. h) ☐ N/A.

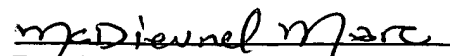
Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Numbering of the specification has been authorized by Daren Kang, Reg., No. 51,859. See attached copy.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.


THOMAS G. BLACK
5 SUPERVISORY PATENT EXAMINER
GROUP 3600

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.


Examiner's signature, if required

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

5 METHOD FOR THE EXCHANGE OF DATA BETWEEN CONTROLS OF
MACHINES, PARTICULARLY ROBOTS

10 FIELD OF THE INVENTION

The invention relates to a method for the exchange of data between controls of machines, particularly robots.

15 BACKGROUND OF THE INVENTION

The transmission of data between controls of machines at present only takes place by means of direct links, either in the form of directly wired inputs and outputs or by means of data transmission field bus systems, while commands or instructions cannot be transmitted in this way. Commands must be given by means of operator elements or a mainframe computer. The corresponding data are transmitted as such directly between the two controls.

25 The hitherto known procedure is complicated, because physical inputs/outputs or the field bus system must be made available. Coincidence must be brought about on both controls, so that the inputs/outputs have the same significances. As the controls do not normally communicate directly via a field bus, but instead by means of an interposed plant programmable logic control (PLC), the latter must take account of a 1:1 mapping in the inputs/outputs. If communication between the controls is to be extended, this involves a change to the control programs of the input
35 and output configuration (additional field bus words, addi-

tional lines for physical inputs/outputs, additional programming expenditure on the PLC side).

The problem of the invention is to overcome the indicated disadvantages and in particular permit a simplification and simple extendibility of communication between two or more controls, whilst largely eliminating fault-prone intermediate layers.

10 SUMMARY OF THE INVENTION

According to the invention the set problem is solved with a method of the aforementioned type, wherein a first control produces an instruction to be transmitted with data to be sent to a second control and with an identification representing said second control, wherein the instruction to be transmitted is provided with an identification of the first control, wherein the first control sends the instruction to be transmitted to the second control, wherein the second control evaluates the data of the instruction and wherein the second control supplies an acknowledgement to the first control.

The invention provides a single-line instruction which, apart from the actual data to be transmitted (physical states and/or control commands) comprises an identification of the receiver control. This creates simple extendibility of the communication by freely programmable commands as parameters of the control instruction (string commands), so that an increased transparency is possible in the user program by the use of freely programmable commands as parameters of the instructions and therefore the use of corresponding names for the commands instead of I/O designations. The invention makes extendibility very simple, because it is only necessary to declare a new global vari-

able, which can then be used on the receiver control, because the latter can manipulate a random global variable. Extendibility is not limited by hardware resources. Apart from data, i.e. in particular physical states, it is possible to also transmit commands in this way. As a result of the invention data and command transmission to robots can take place flexibly without hardware/software expenditure on exchanging robots and without fixing a hierarchy, which is a prerequisite for direct cooperation of balanced robots. A further advantage is that the transmission takes place synchronously, so that the transmission initiator gains a direct acknowledgement concerning the result of the action and can only continue to operate when the command is performed on the other side. According to the invention, not only simple data can be transmitted, by means of a value allocation, but in targeted manner system states can be manipulated, such as the forcing of a step operating mode or the performance of a set selection in the other program.

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According to a preferred development of the invention, the command to be transmitted is formatted as a UDP message and in particular the acknowledgement of the second control is also formatted as a UDP message. According to further developments of the invention, the second control compiles the data received in an internal code and in particular, if the transmitted data contain a control command, the second control executes the same. Finally, according to the invention, the first control only transmits an instruction to be transmitted to a further control on receiving therefrom an acknowledgement to the effect that the second control is ready to perform an instruction. The instruction to be transmitted can also contain the identification of the control in question and also the data to be transmitted in the form of a constant or variable.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages and features of the invention can be gathered from the claims and the following description of an embodiment of the invention with reference to the attached drawings, wherein show:

- Fig. 1 A diagrammatic representation of several mutually cooperating controls.
- Fig. 2 The fundamental sequence of the method according to the invention for exchanging data between two controls.
- Fig. 3 A more precise representation of the processing of the data to be exchanged between controls in the same.

DETAILED DESCRIPTION OF THE DRAWINGS

Fig. 1 shows in exemplified manner four cooperating controls 1 to 4 with each of which is associated a clear address, IP="192.0.1.1" for control 1. Each control 1 to 4 has a computer 1.1 on which runs a control program for a machine, particularly for a robot controlled by the particular control. Each control also has an ethernet driver 1.2 to 4.2 and a network card 1.3 to 4.3 for communication with a network 5, by means of which the controls 1 to 4 are interconnected directly or by means of a switch. The memories contained in a control, such as read-only memories, volatile memories, etc., as well as peripherals, such as in particular input and output devices, are not shown.

For data exchange purposes between two controls 1 and 2, initially a control program running on the first control produces an instruction to be transmitted, which on the one hand includes the data to be transmitted, such as physical parameters of the robot associated with the first control or also instructions for modifying physical parameters in a robot associated with the second control. The instruction to be transmitted also includes the address of the control to which the data or instructions produced by the program running on the first computer are to be transmitted. In addition, said instruction is provided with the sender's own address. This message is then transmitted as a UDP message via the network to the second control (fig. 2). The latter receives the UDP message and then compiles the command to an internal control code. In the embodiment of fig. 2, the interpreter of the control software running in the control 2 executes the command transmitted to it, namely $I=I+1$, i.e., increase by a value of "1" the physical quantity I. Then the control 2 produces an acknowledgement information, which on the one hand contains the address of the first control and on the other a statement concerning the performance result of the received and executed instruction. This message is sent back as a UDP message from control 2 to control 1, whose interpreter waits for this command response, received by the first control and evaluated by the control program of the first control and as a result of the evaluation optionally further instructions are sent by the first control to the second control.

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In this and also in the example of fig. 3 the control 1 acts as a server, whereas control 2 (or also control 3) operates as a client. Associations are not fixed and can instead be modified as a function of the tasks to be performed.

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- Before the control 1 sends a command to another control, control 2 and/or 3 in fig. 3, control 1 initially waits for controls 2 and 3 to perform their tasks, optionally based on a remote control command and give a corresponding acknowledgement, as explained in connection with fig. 2. Then a new command sequence is transmitted to the controls, namely to weld and to fetch a part.
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- 10 Further remote control commands can follow. The control then again waits until the controls 2 and 3 (clients 1 and 2) have given an acknowledgement about the performance of the transmitted responses.
- 15 Controls 2 and 3 (clients 1 and 2) wait for a task, execute the commands received (weld, fetch) and then return to the idle/waiting state.

The address of the particular control can be used as a constant (e.g. RemoteCmd ("192.0.1.3", ...)) or as a variable (e.g. IP[]="192.0.1.2" RemoteCmd(IP[], ...)). The same applies regarding the data to be transmitted, which can also be fully used as a constant (RemoteCmd(..., "MyVar=44")) or a variable (CmdString[]="MyVar=055", RemoteCmd(..., CmdString[])).

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Standard commands are the selection of a program on the control in question (RUNProgName()), the resetting of a program (RESET), the cancellation of a program (CANCEL) and the allocation of a value to a global variable (value allocation) as simple values, strings or Boolean values or also in the form of complex allocations, such as sums, smaller/larger estimates and complex functions. Finally, a further possible command involves the waiting for a specific system state for the controlled control, such as e.g.

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the value of an input 1 becoming equal to that of an input
2: RemoteCmd(IP[]; "Wait for \$IN[1]==\$IN[2]").

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LIST OF REFERENCE NUMERALS

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1-4	Controls
1.1	Computer
1.2-4.2	Ethernet drivers
1.3-4.3	Network cards
5	Network

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